

Wildfire emission and fire severity estimation using satellite detection and modeling



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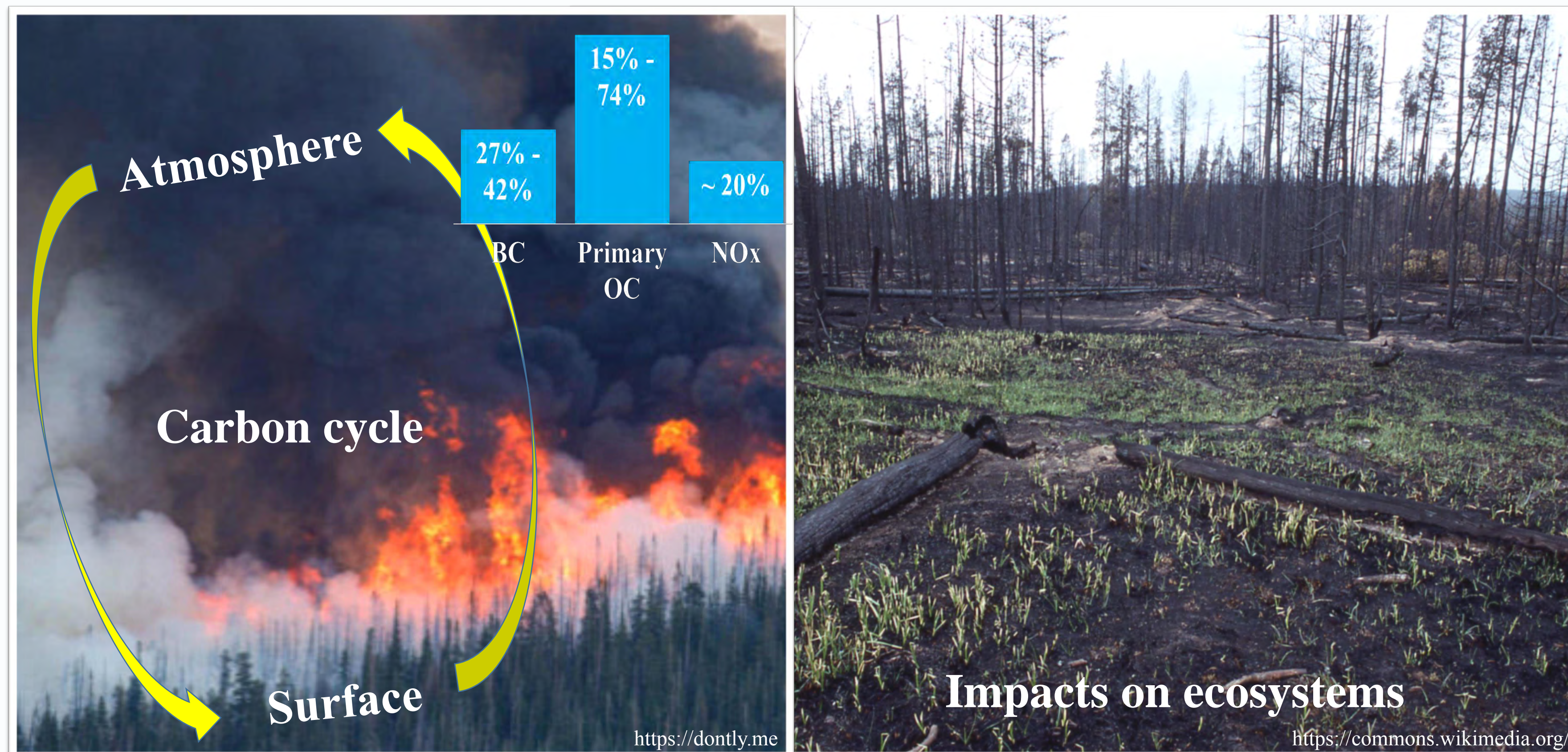
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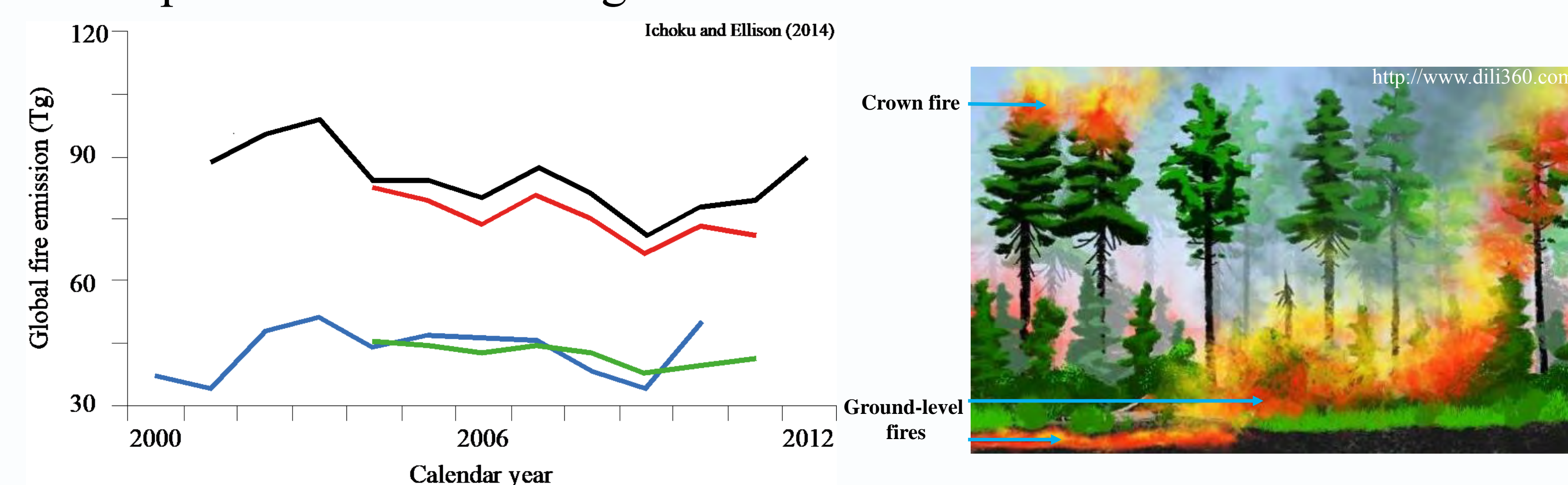
1. Context: Wildfire is a major source of atmospheric particles and gases and it strongly affects plant ecosystems (e.g., vegetation structure and composition). Its impacts are often described through atmospheric emissions or severity on the vegetation.



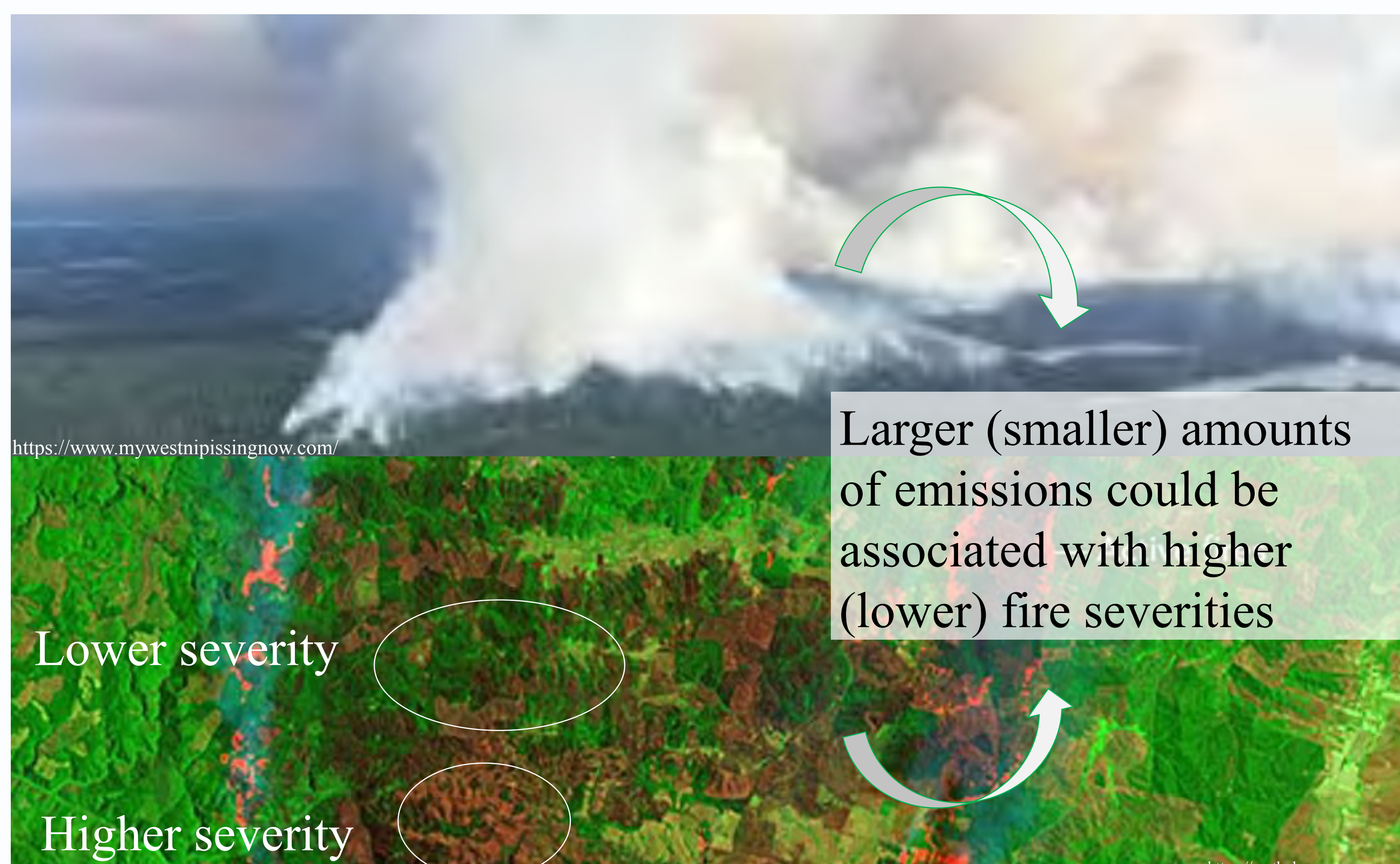
BC: Black Carbon; OC: Primary Organic Carbon; NOx: Nitrogen Oxide

2. Challenges on fire emission and fire severity estimation

- Estimating fire emissions from satellite-detected Fire Radiative Power (FRP) shows large uncertainties and inconsistencies. Part of this problem maybe due to the effects of Fuel Moisture Content (FMC) that are not accounted.
- Fire severity proxies (e.g., dNBR) do not represent ground-level fires compared to crown fires. Performance relies on the quality of the pre- and post-fire satellite images



3. Research Objectives: (a) FRP and FMC could be used to estimate fire emissions more accurately, (b) fire emissions from satellite detection could be used to estimate fire severity, and (c) additional modeling using environmental variables could improve estimation of fire severity.

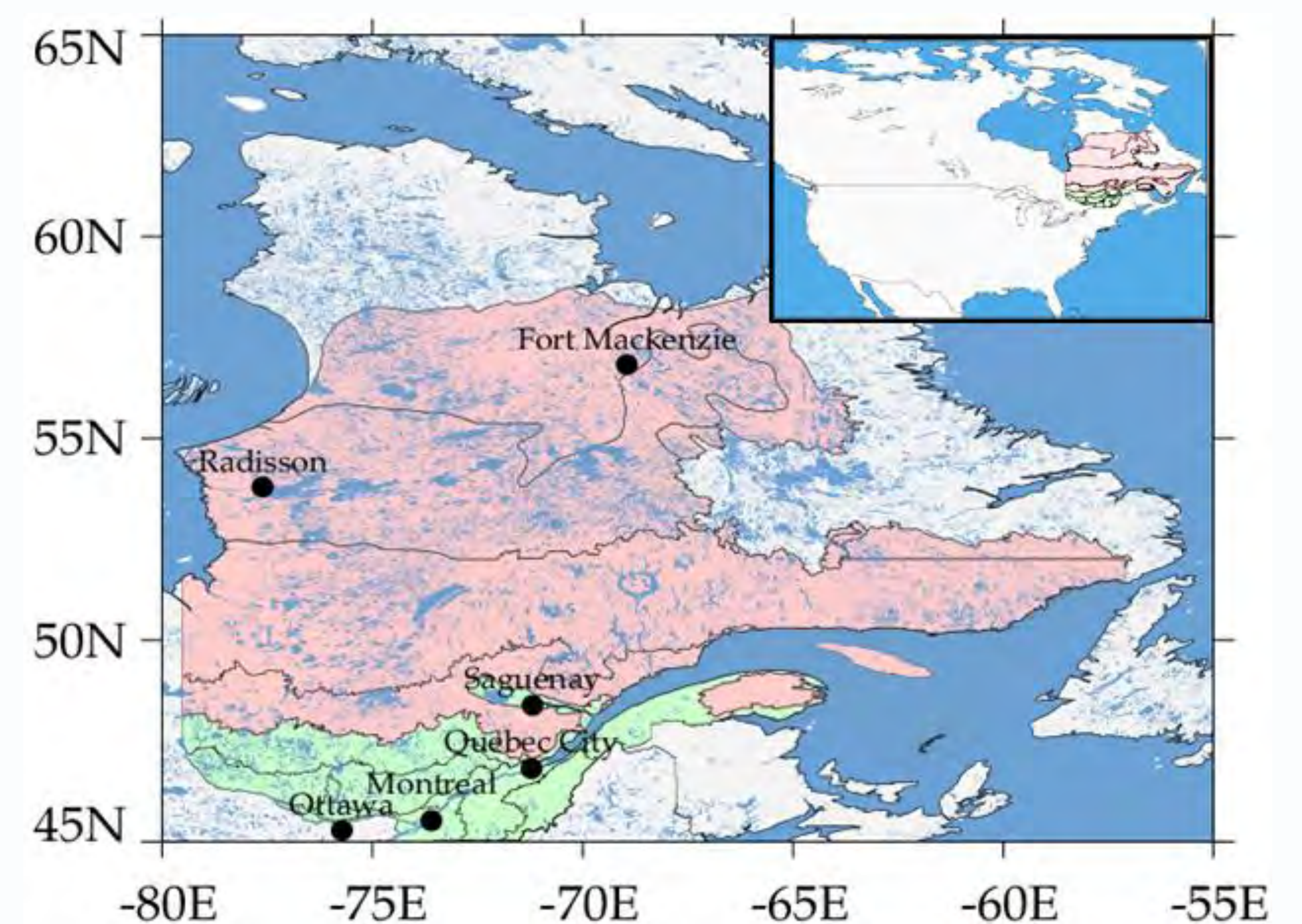


4. Methodology

Multi-source Data

FRP	Aqua and Terra satellites
Fire severity proxy	Landsat satellite
Fire records	MFFP
Vegetation type, environmental variables	Aqua and Terra satellite
FMC proxy (e.g., EDVI)	Retrieved from satellites
Climatic variables	Ouranos and world Climate

Study region

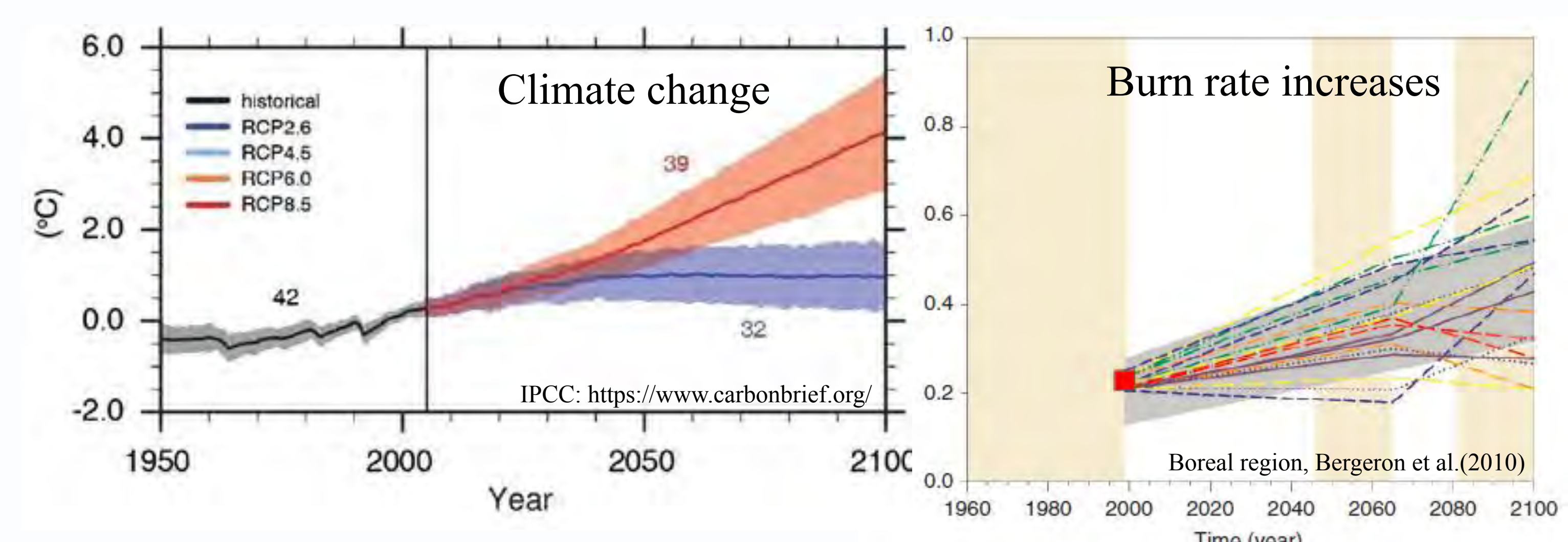


- Proposed models:

$$\text{Fire emission} = f(\text{FRP}, \text{FMC}, \text{environment variables}, \dots)$$

$$\text{Fire severity} = f(\text{fire emission}, \text{climate variables}, \dots)$$

- Predict fire emission and fire severity for future years



We aim to assess how climate change could affect fire emission and fire severity predictions.

Acknowledgments

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